

## REMARKS

### **I. Status of the Application**

Claims 1-15 are pending in the application. Claims 1 and 9 have been amended. Claims 1-6 and 9-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 7,029,784 to Carlstrom (“Carlstrom”) in view of U.S. Pre-Grant Publication No. 2002/0022170 to Franklin et al. (“Franklin”), U.S. Patent No. 4,877,693 to Baker (“Baker”), and further in view of U.S. Patent No 2,143,171 to Anderson (“Anderson”). Claims 7, 8, 14 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Carlstrom, Franklin, Baker, Anderson, as applied to claims 1 and 9 and further in view of U.S. Patent No. 6,007,933 to Jones (“Jones”).

Applicants respectfully request reconsideration of claims 1-15 in view of the foregoing amendments and following remarks. Each of the Examiner’s rejections is addressed below

### **II. The Claims are Non-Obvious over Carlstrom in view of Franklin, Baker, and Anderson**

Claims 1-6 and 9-13 stand rejected under 35 U.S.C. § 103(a) over Carlstrom in view of Franklin, Baker, and Anderson. This rejection is respectfully traversed.

Applicants respectfully submit that the proposed combination does not disclose or make obvious a fuel cell bipolar plate with anode flow channels on the first surface of a first plate, cathode flow channels on the second surface of a second plate, first and second fuel manifolds of unitary construction with the first and second plates, a plurality of center flow channels extending between the first and second plates; and a turnaround plenum in fluid communication with the center flow channels and the anode flow channels, as required by independent claims 1 and 9.

Carlstrom teaches a flow field plate with two interlocking layers having lands that form internal channels therebetween. The internal channels are used to circulate coolant, while the channels on the exterior of the plate circulate fuel and oxidant. Baker is cited as disclosing the passage of fuel through fuel chambers that are coupled to entry ports of anode chambers. Franklin is cited as disclosing a single or multiple manifold(s) for the delivery and removal of reactants and reactant products to and from a separator plate. Anderson is cited as disclosing an assembly made of two plates with nesting configurations.

### **Franklin**

The manifolds of Franklin are separate elements; they are not of unitary construction with first and second plates, such as the folded back portions of the first and second plates of the present invention that form its first and second fuel manifolds. The separate elements of Franklin that form its manifolds can lead to leakage. Accordingly, for this reason the rejection is improper and should be withdrawn.

### **Carlstrom and Baker**

The Office Action asserts that it would have been obvious to use the manifold and port coupling of Baker in the separator plate of Carlstrom in order to direct fuel from one chamber to another. In support of this argument, the Office Action asserts that Carlstrom teaches “that the interior channels can be *adapted for* use as a channel for coolant... or are *generally* used for coolant....” (Emphasis in original.) The Office Action further asserts that “one of ordinary skill in the art would recognize that the internal passages are not *required* by Carlstrom to be used as coolant passages, and would recognize that the internal passages might be used for fuel delivery....” (Emphasis in original.) However, the Office Action provides no reasoning to support this conclusion. There is nothing in Carlstrom that would indicate to one skilled in the

art that the internal passage might or should be used for anything other than coolant. The Supreme Court has stated that “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l v. Teleflex Inc.*, 127 S. Ct. 1727 (2007). The Office Action has failed to meet this test.

Applicant respectfully submits that the Office Action has taken two small phrases from the Summary section of Carlstrom, namely “adapted for” and “generally,” and used those phrases to interpret Carlstrom in a manner very different from that presented in the entirety of the teachings of Carlstrom.

Carlstrom is replete with descriptions of its internal channel being used to provide cooling. Carlstrom provides no other description of a use for the internal channel, and one skilled in the art would clearly understand Carlstrom to teach that its internal channel is designed for coolant flow. One skilled in the art would have no basis for believing that Carlstrom intended for fuel to pass through the internal channel, nor any reason to modify Carlstrom to have fuel pass through the internal channel.

Specifically, the Background section of Carlstrom provides a lengthy discussion of prior art fuel cells, illustrates them in Figs. 1-4, and discusses in detail their cooler plates that function as a heat exchanger by routing coolant through flow channels. In fact, a large part of the discussion of these prior art fuel cells is directed to the flow of coolant through channels formed in the cells. Carlstrom then states that there “is a continuing need for fuel cell designs adapted to achieve objectives including the foregoing in a robust, compact, and cost-effective manner.” (Col. 2, lines 47-49.) Thus, one skilled in the art reading Carlstrom would be led to believe that Carlstrom has developed a compact and robust fuel cell that provides coolant through a channel. Carlstrom in fact does go on to do so.

Applicant notes that the Office Action asserts that the first channel of Carlstrom is intended to carry fuel and the second channel is intended to carry oxidant, citing the Abstract, Figure 1 and column 3, lines 1-24. Applicant respectfully submits that these portions of Carlstrom do not support this position presented in the Office Action. The Abstract of Carlstrom does not discuss the first and second channels whatsoever; it only references an internal fluid channel between two interlocking layers. Figure 1 in and of itself cannot show what the first and second channels are intended to carry. Finally, column 3, lines 1-24 do not describe what is intended to be carried through the first and second channels. This text only states that the first channel “can contain fuel...” and that the second channel “can contain oxidant....” Thus, Carlstrom merely describes the possibility of fuel and oxidant being carried in the first and second channels, respectively, which is quite similar to how the central channel of Carlstrom with its coolant flow is described.

Even though Carlstrom merely describes these uses for the first and second channels as being possible, one skilled in the art reading Carlstrom would understand that its teaching is directed to having fuel and oxidant flow through the first and second channels, respectively. In similar fashion, the fact that Carlstrom uses the word “generally” and the phrase “adapted to receive” in the Summary section to describe the circulation of coolant through the internal fluid channel does not negate that Carlstrom clearly is directed to the use of coolant in the internal channel. To rely on these small phrases as support for the conclusion that Carlstrom is not really directed to providing coolant through the internal chamber is elevating form over substance. It simply does not agree with the teachings of Carlstrom.

Using the same logic presented in the Office Action, it would appear that it would be obvious to use the manifold and port coupling of Baker in the separator plate of Carlstrom in

order to direct fuel from the first channel to the oxidant of the second channel. One skilled in the art would clearly recognize that this goes against the teachings of Carlstrom, and that there would be simply no reason to so modify Carlstrom. Even though it would be physically possible to do so, there is no reason why one skilled in the art would do so.

The same analysis applies to the modification of Carlstrom actually proposed in the Office Action. Even though it would be physically possible to so modify Carlstrom, there is no reason why one skilled in the art would have done so. The purpose of the internal channel is to provide coolant and one skilled in the art would not look to modify it to be connected to the fuel or oxidant channels.

Franklin and Anderson each fail to overcome the deficiencies of Carlstrom and Baker noted above. Neither Franklin nor Anderson disclose or make obvious a turnaround plenum in fluid communication with center flow channels and anode flow channels.

Since these required limitations of independent claims 1 and 9 is not found in any of Carlstrom, Franklin, Baker, or Anderson alone or in combination, the rejection is improper and should be withdrawn.

### **III. Claims 7, 8, 14 and 15 are Non-Obvious over Carlstrom, Franklin et al., Baker, and Anderson in view of Jones**

Claims 7, 8, 14 and 15 have been rejected under 35 U.S.C. § 103(a) over Carlstrom, Franklin, Baker, Anderson, and Jones. Jones is cited as disclosing wires disposed between a bipolar plate and electrode to distribute reactants and products and to provide deformability and resiliency in the cell. This rejection is respectfully traversed.

For the reasons stated above, the Examiner's combination of Carlstrom, Franklin, Baker, and Anderson fails to teach or suggest the subject matter of claims 1 and 9, and Jones fails to cure the deficiencies of these references. Jones simply does not disclose a turnaround plenum in

fluid communication with center flow channels and anode flow channels. Consequently, the rejection is improper and should be withdrawn.

**IV. Conclusion**

Reconsideration and allowance of all the pending claims is respectfully requested. If a telephone conversation with Applicants' attorney would expedite prosecution of the above-identified application, the Examiner is urged to call the undersigned at (617) 720-9600.

Respectfully submitted,

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